Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL GUIDELINE CLEARINGHOUSE

General

Guideline Title

Use of management pathways or algorithms in children with chronic cough: CHEST guideline and Expert Panel report.

Bibliographic Source(s)

Chang AB, Oppenheimer JJ, Weinberger MM, Rubin BK, Weir K, Grant CC, Irwin RS, CHEST Expert Cough Panel. Use of management pathways or algorithms in children with chronic cough: CHEST guideline and Expert Panel report. Chest. 2017 Apr;151(4):875-83. [48 references] PubMed

Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

NEATS Assessment

National Guideline Clearinghouse (NGC) has assessed this guideline's adherence to standards of trustworthiness, derived from the Institute of Medicine's report Clinical Practice Guidelines We Can Trust.

= Poor = Fair = Good = Very Good = Excellent

Assessment	Standard of Trustworthiness
YES	Disclosure of Guideline Funding Source
	Disclosure and Management of Financial Conflict of Interests
	Guideline Development Group Composition
YES	Multidisciplinary Group
YES	Methodologist Involvement

▮▮▮▮▯	Patient and Public Perspectives
	Use of a Systematic Review of Evidence
▮▮▮▮▮	Search Strategy
▮▮▮▮▮	Study Selection
▮▮▮▮▮	Synthesis of Evidence
	Evidence Foundations for and Rating Strength of Recommendations
▮▮▮▮▯	Grading the Quality or Strength of Evidence
▮▮▮▯▯	Benefits and Harms of Recommendations
▮▮▮▮▮	Evidence Summary Supporting Recommendations
▮▮▮▮▮	Rating the Strength of Recommendations
▮▮▮▮▮	Specific and Unambiguous Articulation of Recommendations
▮▯▯▯▯	External Review
▮▮▮▮▮	Updating

Recommendations

Major Recommendations

The grades of recommendation (1A–2C, consensus-based [CB]) and the approach to rating the quality of evidence are defined at the end of the "Major Recommendations" field.

For children aged ≤14 years, the Expert Panel suggests defining chronic cough as the presence of daily cough of at least 4 weeks in duration (Ungraded, Consensus Based Statement).
For children aged ≤14 years with chronic cough, the Expert Panel suggests that an assessment of the effect of cough on the child and the family be undertaken as part of the clinical consultation (Ungraded, Consensus Based Statement).
For children aged ≤14 years with chronic cough, the Expert Panel recommends using pediatric-specific cough management protocols or algorithms (Grade 1B).
For children aged ≤14 years with chronic cough, the Expert Panel recommends taking a systematic approach (such as using a validated guideline) to determine the cause of the cough (Grade 1A).
For children aged ≤14 years with chronic cough, the Expert Panel recommends basing the management or testing algorithm on cough characteristics and the associated clinical history, such as using specific cough pointers like presence of productive/wet cough (Grade 1A).
For children aged ≤14 years with chronic cough, the Expert Panel recommends basing the management on the etiology of the cough. An empirical approach aimed at treating upper airway cough syndrome due to a rhinosinus condition, gastroesophageal reflux disease, and/or asthma should not be used unless other features consistent with these conditions are present (Grade 1A).
For children aged ≤14 years with chronic cough, the Expert Panel suggests that if an empirical trial is

used based on features consistent with a hypothesized diagnosis, the trial should be of a defined limited duration in order to confirm or refute the hypothesized diagnosis (Ungraded, Consensus Based Statement).

For children aged ≤14 years with chronic cough, the Expert Panel recommends that a chest radiograph and, when age appropriate, spirometry (pre- and post-β_2 agonist) be undertaken (Grade 1B).

For children aged ≤14 years with chronic cough, the Expert Panel suggests undertaking tests evaluating recent *Bordetella pertussis* infection when pertussis is clinically suspected (Ungraded, Consensus Based Statement).

For children aged ≤14 years with chronic cough, the Expert Panel recommends not routinely performing additional tests (e.g., skin prick test, Mantoux, bronchoscopy, chest computed tomography [CT]); these should be individualized and undertaken in accordance with the clinical setting and the child's clinical symptoms and signs (Grade 1B).

For children aged >6 years and ≤14 years with chronic cough and asthma clinically suspected, the Expert Panel suggests that a test for airway hyper-responsiveness (AHR) be considered (Grade 2C).

Definitions

American College of Chest Physicians (CHEST) Grading System

Grade of Recommendation	Balance of Benefit vs. Risk and Burdens (Strength of the Recommendation: Level 1 or 2)	Methodologic Strength of Supporting Evidence (Quality of Body of Evidence: A, B, C, or CB)	Implications
Graded evidence-based guideline recommendations			
Strong recommendation, high-quality evidence (1A)	Benefits clearly outweigh risk and burdens or vice versa	Consistent evidence from randomized controlled trials (RCTs) without important limitations or exceptionally strong evidence from observational studies	Recommendation can apply to most patients in most circumstances. Further research is very unlikely to change confidence in the estimate of effect.
Strong recommendation, moderate-quality evidence (1B)	Benefits clearly outweigh risk and burdens or vice versa	Evidence from RCTs with important limitations (inconsistent results, methodologic flaws, indirect or imprecise), or very strong evidence from observational studies	Recommendation can apply to most patients in most circumstances. Higher-quality research may well have an important impact on confidence in the estimate of effect and may change the estimate.
Strong recommendation, low- or very-low-quality evidence (1C)	Benefits clearly outweigh risk and burdens or vice versa	Evidence for at least one critical outcome from observational studies, case series, or from RCTs with serious flaws or indirect evidence	Recommendation can apply to most patients in many circumstances. Higher-quality research is likely to have an important impact on confidence in the estimate of effect and may well change the estimate.
Weak recommendation, high-quality evidence (2A)	Benefits closely balanced with risks and burden	Consistent evidence from RCTs without important limitations or exceptionally strong evidence from observational studies	The best action may differ depending on circumstances or patient's or societal values. Further research is very unlikely to change confidence in the estimate of effect.
Weak recommendation, moderate-quality evidence (2B)	Benefits closely balanced with risks and burden	Evidence from RCTs with important limitations (inconsistent results, methodologic flaws, indirect or imprecise) or very strong evidence	Best action may differ depending on circumstances or patient's or societal values. Higher-quality research may well have an important impact on confidence in the estimate of effect and

Grade of Recommendation	Balance of Benefit vs. Risk and Burdens (Strength of the Recommendation; Level 1 or 2)	Methodologic Strength of Supporting Evidence (Quality of Body of Evidence: A, B, C, or CB)	Implications
		from observational studies	may change the estimate.
Weak recommendation, low- or very-low-quality evidence (2C)	Uncertainty in the estimates of benefits, risks, and burden; benefits, risk, and burden may be closely balanced	Evidence for at least one critical outcome from observational studies, case series, or RCTs, with serious flaws or indirect evidence	Other alternatives may be equally reasonable. Higher-quality research is likely to have an important impact on confidence in the estimate of effect and may well change the estimate.
Nongraded consensus-based suggestions			
Consensus-based (CB)	Uncertainty due to lack of evidence but expert opinion that benefits outweigh risk and burdens or vice versa	Insufficient evidence for a graded recommendation	Future research may well have an important impact on confidence in the estimate of effect and may change the estimate.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Chronic cough

Guideline Category

Diagnosis

Evaluation

Management

Clinical Specialty

Allergy and Immunology

Family Practice

Internal Medicine

Pediatrics

Pulmonary Medicine

Intended Users

Advanced Practice Nurses

Nurses

Physician Assistants

Physicians

Respiratory Care Practitioners

Guideline Objective(s)

To examine various aspects in the generic approach (use of cough algorithms and tests) to the management of chronic cough in children (aged ≤14 years) based on key questions (KQs) using the Population, Intervention, Comparison, Outcome format

Target Population

Children aged ≤14 years with chronic cough (>4 weeks' duration)

Interventions and Practices Considered

1. Defining chronic cough
2. Assessment of the effect of cough through clinical consultation
3. Pediatric-specific cough management protocols or algorithms, based on cough characteristics and clinical history (e.g., cough pointers)
4. Systematic approach to determine cause of cough
5. Empirical approach to management based on etiology of cough
6. Empirical trial of a defined limited duration
7. Chest radiograph
8. Spirometry (pre- and post-β_2 agonist)
9. Tests evaluating recent *Bordetella pertussis* infection
10. Test for airway hyperresponsiveness (AHR) in children >6 years
11. Additional tests (e.g., skin prick test, Mantoux, bronchoscopy, chest computed tomography [CT]) (considered but not routinely recommended)

Major Outcomes Considered

- Quality of life
- Symptom burden
- Cough resolution

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

The review authors undertook the systematic reviews based on the protocol established by selected members of the American College of Chest Physicians (CHEST) expert cough panel. They used the Preferred Reporting Items for Systematic Reviews and Meta-analyses statement for reporting.

Study Identification and Eligibility Criteria

Librarians from the University of Massachusetts Medical School undertook searches for all three questions between February 28 and March 11, 2015, using the search strategies outlined in e-Table 1 in the systematic review (see the "Availability of Companion Documents" field). For the CHEST cough guidelines, it was determined a priori that the age cutoff for pediatric and adult components was to be 14 years. However, to ensure that all relevant studies were captured, the search filter included studies up to age 18 years. They included only studies published in English. The librarians identified and removed duplicates between Scopus and PubMed searches before sending the abstracts to the two authors who reviewed the abstracts.

Data Extraction and Quality Assessment

The two reviewers independently reviewed all abstracts and fully agreed on which full-text articles to retrieve to assess for potentially eligible studies. It was planned that disagreements that could not be resolved by consensus would be adjudicated by a third reviewer.

See the Online Supplement for additional information on study selection criteria and search strategy (see the "Availability of Companion Documents" field).

Number of Source Documents

- Key Question 1: 9 studies included in the current systematic review
- Key Question 2: no study included in the current systematic review
- Key Question 3: 8 studies met inclusion criteria
- Key Question 4: 12 studies included in the current systematic review
- Key Question 5: 4 studies included in the current systematic review

See e-Figures 1 to 5 in the online supplement (see the "Availability of Companion Documents" field) for the study selection process.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

The quality of evidence is based on the five domains of risk of bias, inconsistency, indirectness, reporting bias and imprecision. The quality of evidence (i.e., the confidence in estimates) is rated as high (A), moderate (B), low or very low (C) (see the "Rating Scheme for the Strength of the Recommendations" field).

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Data Extraction and Quality Assessment

For randomized controlled trials (RCTs), the reviewers independently assessed the risk of bias criteria using criteria in Cochrane Reviews. Criteria used were random sequence generation (selection bias), allocation concealment (selection bias), blinding of participants and personnel (performance bias) to the

study protocol, blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), and selective reporting (reporting bias). For cohort studies, data were extracted by a single author and checked by a second. In cohort studies, the authors reported on the study's setting, number enrolled and completing the study, inclusion and exclusion criteria, and other factors (see Tables 1-3 in the systematic review [see the "Availability of Companion Documents" field]) that they considered important for interpreting studies on chronic cough specific to the key questions (KQs). These factors included an a priori definition for diagnoses, how cough was measured and resolution defined, and whether the period effect was considered. Reasons for these factors, considered quality factors for pediatric cough studies, are published elsewhere.

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

For the American College of Chest Physicians (CHEST) cough guidelines, it was a priori determined that the age cutoff for pediatric and adult components was 14 years. The Expert Panel used a standard method as previously described by Vertigan et al.: "The methodology used by the CHEST Guideline Oversight Committee to select the Expert Cough Panel Chair and the international panel of experts, perform the synthesis of the evidence and develop the recommendations and suggestions has been published. Key questions and parameters of eligibility were developed for this topic. Existing guidelines, systematic reviews, and primary studies were assessed for relevance and quality, and were used to support the evidence-based graded recommendations or suggestions. A highly structured consensus-based Delphi approach was employed to provide expert advice on all guidance statements. The total number of eligible voters for each guideline statement varied based on the number of managed individuals recused from voting on any particular statements because of their potential conflicts of interest. Transparency of process was documented. Further details of the methods have been published elsewhere. Consistent with recent recommendations from the Institute of Medicine, the Panel conducted a comprehensive, systematic review of the literature to provide the evidence base for this guideline."

See the methodology companions in the "Availability of Companion Documents" field for additional information.

Guideline Framework

As previously described, "the American College of Chest Physicians has adopted the GRADE framework (The Grading of Recommendations Assessment, Development and Evaluation). This framework separates the process of rating the quality of evidence from that of determining the strength of recommendation. The quality of evidence is based on the five domains of risk of bias, inconsistency, indirectness, reporting bias and imprecision. The quality of evidence (i.e., the confidence in estimates) is rated as high (A), moderate (B), low or very low (C). The strength of recommendation is determined based on the quality of evidence, balance of benefits and harms, patients' values and preferences, and availability of resources. Recommendations can be strong or weak."

State of the Available Evidence

The systematic reviews (and e-Appendix 1, e-Tables 4 and 5, e-Figs 4 and 5 [see the "Availability of Companion Documents field]) identified high-quality evidence to support some recommendations but not all. When there was insufficient evidence for diagnosis and management recommendations, the panel heavily placed great emphasis on patient values, preferences, ease and cost of tests, and availability of potential therapies. The panel also made several suggestions for future research.

Rating Scheme for the Strength of the Recommendations

American College of Chest Physicians (CHEST) Grading System

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Nongraded consensus-based suggestions			
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Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Review Process

After the Cough Executive Committee provided final approval, the NetWorks, Guidelines Oversight Committee (GOC), and Board of Regents disseminated manuscripts and supporting documentation for review. The CHEST NetWorks of interested members, in the areas of Airways Disorders, Allied Health, Clinical Pulmonary Medicine, Pediatric Chest Medicine, Pulmonary Physiology Function and Rehabilitation, and Respiratory Care, reviewed the content of the manuscripts. Members from the CHEST Board of Regents and GOC reviewed both content and methods, including consistency, accuracy, and completeness. The CHEST journal peer review process overlapped with the later rounds of these reviews. All ideas for modification were marked as mandatory or suggested, responded to or justified, and tracked through the multiple rounds of review. The CHEST Presidential line of succession provided the final approval allowing submission to the journal.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Early diagnosis is important, as delayed diagnosis (e.g., foreign body) may cause chronic respiratory morbidity, whereas early diagnosis of chronic disease leads to appropriate management and subsequent resolution of cough and improved quality of life (QoL). Use of cough algorithms or pathways can potentially lead to earlier diagnosis and reduce morbidity, unnecessary costs, and medication use associated with chronic cough.
- The variations in algorithms raise the question of whether algorithms that are specific to the clinical setting should be used, such as in developing countries, where the most common causes of cough are likely different (e.g., tuberculosis, parasitic disease). Irrespective of the relative prevalence of different conditions, the correct diagnosis would be obtained if a cough pathway such as the American College of Chest Physicians (CHEST) guideline is used.

Potential Harms

- Recognition of cough pointers (see Table 1 in original guideline document) is dependent on accurate identification (i.e., expertise of physicians and the caregiver's history).
- Ascribing causes for the cough has an inherent high risk of bias related to the placebo and "period

effects" (the natural resolution of cough over time) evident in cough-related intervention studies.

Qualifying Statements

Qualifying Statements

Disclaimer

American College of Chest Physician (CHEST) guidelines are intended for general information only, are not medical advice, and do not replace professional medical care and physician advice, which always should be sought for any medical condition. The complete disclaimer for this guideline can be accessed at http://www.chestnet.org/Guidelines-and-Resources .

Potential Biases in the Review Process

One of the authors was involved in the randomized controlled trials (RCTs) and other cohort studies included in these systematic reviews. However, the authors took steps to reduce potential bias by having another author reviewing the extracted data; the risk of bias assessments was undertaken independently.

Implementation of the Guideline

Description of Implementation Strategy

Dissemination

After publication, the guidelines were promoted to a wide audience of physicians, other health-care providers, and the public through multiple avenues. Press releases were prepared for both the lay and medical media, with major outreach efforts to all relevant print, broadcast, and Internet media. Panelists located in various large media markets were identified as potential spokespersons for interviews. Social media promotion was facilitated over Twitter, Facebook, CHEST e-Communities, internal and external blogs, and other communication routes. Blast communications were sent to CHEST members with links to the publication and postings on CHEST's Web site.

In addition to publication in *CHEST*, other derivative products were prepared to help with implementation, including slide sets, algorithms, and other clinical tools. These derivative products are posted on the CHEST Web site and will be made available in CHEST Guidelines. CHEST Guidelines will be the repository for the most current recommendations and suggestions from all CHEST guidelines, consensus statements, and hybrid documents. This online repository will also house a collection of related resources.

Associations that appointed representatives earlier in the process were asked to consider endorsing the approved guidelines for listing in the final publication. These organizations were requested to help promote the publication to their memberships through newsletters, Web sites, and other means.

Implementation Tools

Mobile Device Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality

Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Chang AB, Oppenheimer JJ, Weinberger MM, Rubin BK, Weir K, Grant CC, Irwin RS, CHEST Expert Cough Panel. Use of management pathways or algorithms in children with chronic cough: CHEST guideline and Expert Panel report. Chest. 2017 Apr;151(4):875-83. [48 references] PubMed

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2017 Apr

Guideline Developer(s)

American College of Chest Physicians - Medical Specialty Society

Source(s) of Funding

Role of Sponsors

The American College of Chest Physicians (CHEST) was the sole supporter of these guidelines, this article, and the innovations addressed within.

Funding/Support

The authors have reported to *CHEST* that no funding was received for this study.

Guideline Committee

American College of Chest Physicians (CHEST) Expert Cough Panel

Composition of Group That Authored the Guideline

Authors: Anne B. Chang, MBBS, PhD, MPH; John J. Oppenheimer, MD; Miles M. Weinberger, MD, FCCP; Bruce K. Rubin, MD; Kelly Weir, BSpThy, MSpPath, PhD, CPSP; Cameron C. Grant, MBChB, PhD; Richard S. Irwin, MD, Master FCCP

Financial Disclosures/Conflicts of Interest

Conflict-of-Interest Reviews

For practitioners to adhere to guideline or consensus statement recommendations, they must have confidence that the convened experts represent all relevant stakeholders and do not harbor biases that might influence the discussions and resulting clinical recommendations or suggestions. This is even more important when guidance includes consensus of a panel of experts. The chair of this project was vetted and determined to be free of conflicts of interest (COIs). The Guidelines Oversight Committee (GOC) Policies and Procedures Subcommittee and the full GOC, in accordance with explicit rules regarding COI and expertise, carefully reviewed all nominees. Greater explanations of these and other evidence-based processes are published separately. The panel is predominantly free of relevant COIs. A few individuals with moderate conflicts, whose expertise was highly valued and who could not be easily replaced, were selected. These panelists were given individualized management plans and restricted from writing and voting on clinical content areas related to current conflicts and participation in future activities that could be perceived as conflicts.

Financial/Nonfinancial Disclosures

The authors have reported to *CHEST* the following: A. B. C. is supported by a National Health and Medical Research Council (NHMRC) practitioner fellowship [grant 1058213] and has been awarded multiple grants from the NHMRC related to diseases associated with pediatric cough. She is an author of several of the papers included in this review. J. J. O. is on the Board of Directors of the American Board of Allergy and Immunology; is an Associate Editor of the Annals of Allergy and Allergy Watch and a reviewer for Up to Date; has performed clinical research for Boehringer Ingelheim, AstraZeneca, Glaxo, Medimmune, and Novartis; is on the adjudication committee for AstraZeneca and Novartis; is on the data safety monitoring board for Ohio State University; and is a consultant for Glaxo, Myelin, Church and Dwight, and Meda. None declared (M. M. W., B. K. R., K. W., G. C. C., R. S. I.). Moreover, although R. S. I. is the Editor in Chief of CHEST, the review and all editorial decisions regarding this manuscript were made independently by others.

Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the CHEST Journal Web site . Also available to CHEST Journal subscribers through the CHEST app for iOS and Android.

Availability of Companion Documents

The following are available:

Use of management pathways or algorithms in children with chronic cough: CHEST guideline and Expert Panel report. Online supplement. Chest; 2017;151(4) 875-83. Available from the CHEST Journal Web site .

Use of management pathways or algorithms in children with chronic cough: systematic reviews.

Chest. 2016 Jan; 149(1):106-19. Available from the CHEST Journal Web site .

Use of management pathways or algorithms in children with chronic cough: systematic reviews. Online supplement. Chest. 2016 Jan. Available from the CHEST Journal Web site .

Lewis SZ, Diekemper RL, French CT, Gold PM, Irwin RS. Methodologies for the development of the management of cough: CHEST guideline and Expert Panel report. Chest. 2014 Jul;146(5):1395-402. Available from the CHEST Journal Web site .

Lewis SZ, Diekemper RL, Ornelas J, Casey KR. Methodologies for the development of CHEST guidelines and Expert Panel reports. Chest. 2014 Jul;146(1):182-92. Available from the CHEST Journal Web site .

Irwin RS, French CT, Lewis SZ, Diekemper RL, Gold PM. Overview of the management of cough: CHEST guideline and Expert Panel report. Chest. 2014(4): 885-9. Available from the CHEST Journal Web site .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on October 4, 2017. The guideline developer agreed to not review the content.

This NEATS assessment was completed by ECRI Institute on October 4, 2017. The guideline developer agreed to not review the content.

Copyright Statement

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